

System comprising at least two printed circuit boards

The invention relates to a system comprising at least two printed circuit boards on which printed circuits are provided, said printed circuit boards each comprising electrical contact elements for electrically interconnecting the printed circuit boards.

5 Such a system is known from German patent specification No. 196 36 335 (Siemens AG). In this known system, a so-called daughterboard is secured at right angles onto a so-called motherboard using a separate connector, for which purpose the daughterboard is arranged in a slot of the connector and the whole is subsequently connected to the motherboard. On both flat sides of the board, the daughterboard comprises various  
10 contact elements in the form of a number of spaced apart metal contact strips which, in the mounted state of the daughterboard, electroconductively contact the corresponding contact elements of the connector which are situated on either side of the slot. The whole of the daughterboard and the connector is subsequently electroconductively connected to the motherboard by soldering connection contacts of the connector to contact elements of the  
15 motherboard. In this manner, the printed circuits of both printed circuit boards are electrically interconnected.

A drawback of the system known from the above-mentioned German patent publication resides in that the electric connection between the daughterboard and the connector on the one hand and the electric connection of the daughterboard and the connector  
20 with the motherboard on the other hand is found to be too weak in practice. This can be attributed to the fact that the electric contact between the above-mentioned metal contact strips and the contact elements of the connector can be readily interrupted due to, for example, shifting of the daughterboard, while the solder contacts with the motherboard can readily become detached when the whole is subjected to a mechanical load.

25 It is an object of the invention to improve the system in accordance with the prior art in such a manner that a reliable electric connection between the printed circuit boards is attained; to achieve this, a system of the type mentioned in the opening paragraph is characterized in accordance with the invention in that the electrical contact elements of one

printed circuit board are formed by a number of electroconductive pins manufactured so as to be in one piece with said printed circuit board, and in that the electrical contact elements of the other printed circuit board are formed by a number of recesses having an electroconductive inner surface formed in said other printed circuit board, the pins entering the corresponding recesses and being secured therein by soldering. Preferably, the motherboard and the daughterboard are mounted so as to be mutually perpendicular. The electrical conduction of the pins and the respective recesses is attained by omnilaterally providing the pins, at the outer surface, and the recesses, at the inner surface, with an electroconductive material which preferably comprises metal. The system in question has the particular advantage that a separate connector providing for a reliable connection between the printed circuit boards is not required.

In a preferred embodiment of a system in accordance with the invention, the electroconductive material is provided on the outside surface of the pins and on the inside surface of the recesses by means of electrolysis.

In a further preferred embodiment of a system in accordance with the invention, the thickness of the electroconductive material ranges between 25  $\mu\text{m}$  and 40  $\mu\text{m}$ , and is in particular approximately 35  $\mu\text{m}$ .

In a further preferred embodiment of a system in accordance with the invention, the electroconductive pin has a diameter below 3 mm, in particular below 2 mm, and more in particular below 1.5 mm.

The invention also relates to a method of manufacturing printed circuit boards which are part of a system in accordance with the invention, wherein the electroconductive pins are formed by material removal, in particular milling or drilling, from one printed circuit board. Preferably, adjoining electroconductive pins of one printed circuit board are electrically insulated with respect to each other by removing intermediate material from said printed circuit board, in particular by means of milling or drilling.

These and other aspects of the invention will be apparent from and elucidated with reference to the embodiment(s) described hereinafter.

In the drawings:

Fig. 1 is a diagrammatic perspective view of a motherboard and a daughterboard in accordance with a preferred modification of the invention;

Fig. 2 shows the printed circuit boards shown in Fig. 1 in the operating state.

Fig. 1 shows a motherboard 1 and a daughterboard 2 provided with printed circuits whose copper strips are referenced 3. The motherboard 1 comprises, in this case, eighteen drilled round recesses 4 whose inner surfaces are metallized. The daughterboard 2 comprises eighteen metallized pins of square cross-section which correspond to the round recesses 4. The pins 5 are milled from the daughterboard 2 and hence are in one piece with said daughterboard. In order to preclude electroconductive contact between adjoining pins 5 caused by metal tracks in regions of the daughterboard 2 situated between adjoining pins 5, these regions are milled off in the form of a semi-circular arch referenced 6. The above-mentioned verb "to metallize" and its conjugations, is to be taken to mean in this connection that the entire inner surface of the recesses 4 and the entire outside of the pins 5 are clad with a preferably 35  $\mu\text{m}$  thick metal layer.

Fig. 2 shows the printed circuit boards 1, 2 of Fig. 1 in the mounted state, solder 7 being provided between the recesses 4 and the corresponding pins 5 in order to make sure that the assembly is reliably mounted.

The invention is not limited to the embodiment shown in the drawings, but also comprises other variants within the scope of the annexed claims.